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Solidification of borate ion-exchange resins by alkali-activated slag cements

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Abstract

© 2018, Fundatia Serban Solacolu. All rights reserved. In this study, a mineral matrix based on alkali-activated slag cement (AASC) was found to be suitable for solidification of up to 35% (by volume) of borate ion-exchange resins (IERs) at pH values of 8.5 to 10.5. Experimental-statistical modelling, X-ray diffraction, and scanning electron microscopy/energy dispersive spectroscopy analyses were used to study the waste samples. According to the results of a four-factor experiment, the strengths of waste samples based on AASC-based mineral matrices and borate IERs were mostly determined by the nature of the alkali component and the pH of the borate IERs. The strengths of the waste samples could be improved by some modifications of the binder material - increasing the Na2O concentration and introducing polypropylene fibres. The main reaction products in the (GGBFS)-(sodium metasilicate, sodium hydroxide)-(borate solution) system were C-(A)-S-H, calcite (CaCO3), hydrotalcite (MgO6.667Al0.333)(OH)2(CO3)0.167(H2O)0.5calcium silicate hydrates C-S-H (I) - CaO.SiO2.H2O and Ca1.5.SiO3.5.H2O, and ulexite NaCaB5O6(OH)6(H2O)5.

Keywords

Alkali-activated slag cement, Calorimetric test, Compressive strengths, Ion-exchange resin waste, Modeling, Polypropylene fibre

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